The Examiner rejected claims 1-4, 6 and 8 under 35 U.S.C.§ 103(a) as being unpatentable over Xi et al. (U.S. Patent 7,026,238) in view of Mathis (U.S. Patent 5,370,737).

Applicant respectfully submits that claim 1 is patentable over Xi in view of Mathis as there is no disclosure or suggestion in the combined references of depositing a first barrier layer over inner sidewall and bottom surfaces of the via, etching selectively, in a PVD tool, the bottom surface of the via to substantially eliminate the barrier layer from the bottom surface; and then, depositing a second barrier layer over the inner surfaces of the via including the bottom surface of the via. Xi teaches depositing a first barrier and etching to remove the first barrier from the horizontal surfaces. Xi then teaches depositing a second barrier. Xi does not disclose or suggest etching the first barrier in a PVD tool as claimed. The Examiner applies Mathis to teach selective etching in a PVD tool. Mathis teaches a treatment chamber that may be used for carrying out CVD processes, PVD processes, and etching processes (col 8, lines 37-43). While the treatment chamber may be used for various processes, this does not mean that the overall tool employing the treatment chamber may be used for performing all of the CVD, PVD, and etching processes. See, for example, col. 1, lines 6-15, where Mathis states the invention is directed to a vacuum treatment apparatus for PVD or CVD or other treatment processes.

Mathis does, however, disclose a new type of tool in FIG. 6 with treatment stations for performing various processes at each stage (col. 10, lines 38-44). However, this does not disclose or suggest, in combination with Xi, etching a first barrier in a PVD tool as claimed. Accordingly, Applicant respectfully submits that claim 1 and the claims dependent thereon are patentable over the references.

The Examiner rejected claim 5 under 35 U.S.C.§ 103(a) as being unpatentable over Xi et al. (U.S. Patent 7,026,238) in view of Aoi (U.S. Patent 6,197,696).

Applicant respectfully submits that claim 5 is patentable over Xi in view of Aoi as there is no disclosure or suggestion in the references of depositing a first barrier layer, etching selectively the bottom surface of the via to substantially eliminate the barrier layer from the bottom surface, and depositing a second barrier layer, wherein the first barrier layer is a conformal barrier layer of plasma+silane treated CVD TiNSi. As noted by the Examiner, Xi fails to disclose or suggest the first barrier layer being a conformal barrier layer of plasma+silane treated CVD TiNSi. Aoi is applied to teach plasma + silane treatment. However, Aoi teaches a plasma CVD process with silane for forming thick insulating layers. Aoi does not disclose or suggestion plasma + silane treatment for a barrier layer, much less for TiNSi. There is no disclosure or suggestion in the references of the first barrier layer being a conformal barrier layer of plasma + silane treated CVD TiNSi.

There is no reason why one of ordinary skill in the art would have applied Aoi's plasma+silane method for forming an interlevel dielectric layer to the barrier layer of Xi. The Examiner argues that Aoi teaches plasma+silane for the purpose of providing an organic/inorganic hybrid. While Aoi teaches an organic/inorganic interlevel dielectric layer, there is no reasoning provided as to why one of ordinary skill in the art would have desired this organic/inorganic property for a barrier layer. Aoi, itself, teaches forming a barrier layer and does not use the plasma+silane process in forming the barrier layer. At most, a combination of the references would suggest using Aoi's plasma+silane process to form the interlevel dielectric 204 of Xi, not barrier layer 220. There is no disclosure or suggestion in the references for applying Aoi's plasma+silane process to form TiNSi as required by the claim. Accordingly, Applicant respectfully submits that claim 5 is patentable over the references.

The Examiner rejected claim 7 under 35 U.S.C.§ 103(a) as being unpatentable over Xi et al. (U.S. Patent 7,026,238)/Mathis (U.S. Patent 5,370,737) as applied to claim 1 above.

Applicant respectfully submits that claim 7 is patentable over Xi for the same reasons discussed above relative to claim 1 from which claim 7 depends.

The Examiner rejected claims 9-11 under 35 U.S.C.§ 103(a) as being unpatentable over Xi et al. (U.S. Patent 7,026,238)/Mathis (U.S. Patent 5,370,737) as applied to claim 1 above, and further in view of Rozbicki et al. (U.S. Patent 6,607,977).

Applicant respectfully submits that claims 9-11 is patentable over Xi in view of Mathis and Rozbicki for the same reasons discussed above relative to claim 1 from which these claims depend. Rozbicki is added to teach ionized PVD. Rozbicki teaches a simultaneous etch/deposition in a PVD chamber. This differs from the claimed invention in that claim 1 requires etching and after etching, depositing. Simultaneous etch/dep is not equivalent to etch followed by dep. Simultaneous etch/dep results in at least partial removal of the first barrier at the bottom of the via with no deposition of the second barrier across the bottom of the via as shown in Figure 3D. In contrast, the claimed etch followed by dep results in removal of the first barrier at the bottom of the via and deposition of the second barrier over the bottom of the via. Accordingly, Applicant respectfully submits that claims 9-11 are patentable over the references.

The Examiner rejected claim 12 under 35 U.S.C.§ 103(a) as being unpatentable over Xi et al. (U.S. Patent 7,026,238)/Mathis (U.S. Patent 5,370,737) as applied to claim 1 above.

Applicant respectfully submits that claim 12 is patentable over Xi/Mathis for the same reasons discussed above relative to claim 1 from which claim 12 depends.

The other references cited by the Examiner have been reviewed, but are not felt to come within the scope of the claims as amended.

In light of the above, Applicant respectfully requests withdrawal of the Examiner's rejections and allowance of claims 1-12. If the Examiner has any questions or other

correspondence regarding this application, Applicant requests that the Examiner contact Applicant's attorney at the below listed telephone number and address.

Respectfully submitted,

/Jacqueline J Garner/

Jacqueline J. Garner
Reg. No. 36,144

Texas Instruments Incorporated
P. O. Box 655474, M.S. 3999
Dallas, Texas 75265
Phone: (214) 532-9348
Fax: (972) 917-4418